Notice No. 4

Rules and Regulations for the Classification of Ships, July 2015

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Issue date: December 2015

Amendments to	Effective date
Part 1, Chapter 1, Section 4	1 January 2016
Part 1, Chapter 3, Sections 1 & 4	1 January 2016
Part 5, Chapter 1, Section 3	1 January 2016
Part 5, Chapter 12, Section 9	1 January 2016
Part 5, Chapter 15, Sections 1 & 8	1 January 2016
Part 6, Chapter 2, Sections 1, 11, 14 & 17	1 January 2016

Lloyd's Register

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Part 1, Chapter 1

General Regulations

Effective date 1 January 2016

■ *Section 4*
Naval Ship Technical Committee

4.6 The function of the Naval Ship Technical Committee is to consider technical issues connected with Naval Ship matters and to approve proposals for new Naval Ship Rules, or amendments to existing Naval Ship Rules. Where appropriate, Naval Ship Technical Committee may also recognise alternative LR Rule requirements that have been approved by the other Lloyd's Register Technical Committee as adjunct to the Naval Ship Rules.

Part 1, Chapter 3

Periodical Survey Regulations

Effective date 1 January 2016

■ *Section 1*
General

1.8 Repairs

1.8.3 Where the damage found on structure mentioned in Pt 1, Ch 3, 1.8 Repairs is isolated and of a localised nature which does not affect the ship's structural integrity (as, for example, a localised, isolated and very minor hole in a cross-deck strip), consideration may be given by the Surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity ~~and impose a Condition of Class with a specific time limit~~ after careful evaluation of the surrounding structure and impose an associated Condition of Class with a specific short-term time limit in order to complete the repair and retain classification.

■ *Section 4*
Docking Surveys and In-water Surveys - Hull and machinery requirements

4.3 In-water Surveys

4.3.7 The In-water Survey is to be carried out by a qualified diver employed by a firm approved by LR. In addition, for certain aspects of the In-water Survey, consideration may be given to the use of a Remotely Operated Vehicle (ROV) operated by the LR approved firm.

Part 5, Chapter 1

General Requirements for the Design and Construction of Machinery

Effective date 1 January 2016

■ *Section 3*
Operating conditions

3.7 Inclination of ship

Table 1.3.2: Inclination of ship

Installations, components	Angle of inclination, degrees, *see* Note 1			
	Athwartships		Fore-and-aft	
	Static	Dynamic	Static	Dynamic
Main and auxiliary machinery essential to the propulsion and safety of the ship	15	22,5	5 *see* Note 2	7,5
Emergency machinery and equipment fitted in accordance with Statutory Requirements	22,5 *see* Note 3	22,5 *see* Note 3	10	10

Note 1. Athwartships and fore-and-aft inclinations may occur simultaneously.

Note 2. Where the length of the ship exceeds 100 m, the fore-and-aft static angle of inclination may be taken as:

$\frac{500}{L}$ degrees

where *L* = length of ship, in metres.

Note 3. In ships for the carriage of liquefied gas and of liquid chemicals the emergency machinery and equipment fitted in accordance with Statutory Requirements is also to remain operable with the ship flooded to a final athwartships inclination to a maximum angle of 30°.

Part 5, Chapter 12

Piping Design Requirements

Effective date 1 January 2016

■ *Section 9*
Piping for LPG/LNG carriers, gas fuelled ships and classed refrigeration systems

9.3 Classes of pipe

9.3.2 Table 12.1.1 Maximum pressure and temperature conditions for Class II and III piping systems piping systems containing LPG/LNG, cargo or fuel gas as the conveyed medium are to be treated as 'Flammable liquids'. These piping systems are to be categorised as Class II. Vapour lines are also to be categorised as Class II systems but the upper limit on pressure may be increased to ~~40 bar~~ 4 MPa gauge in accordance with the 'Other media'. Where higher design pressures are applied, such as in a regasification system, liquid lines above ~~16 bar~~ 1,6 MPa gauge and vapour lines above ~~40 bar~~ 4 MPa gauge are to be categorised as Class I. All open ended pipes, such as vent lines and pipes inside the cargo tanks may be categorised as Class III, provided that the temperature of the cargo at the pressure relief valve setting is not colder than minus 55°C.

9.4 Materials

9.4.3 ~~For stainless steel pipes, valve castings and forgings intended for service temperatures down to minus 55°C, a LR materials certificate is required unless:~~ For stainless steel pipes, valve castings and forgings, a manufacturer's certificate is acceptable where the intended service temperature is not colder than minus 55°C and:

- *DN* <50 or
- *DN* ≤150 and *DN* x *P* <250~~0~~

  Where:
  DN = nominal diameter, mm
  P = design pressure, in MPa gauge

~~where a manufacturer's certificate is acceptable.~~ In all other cases, an LR materials certificate is required.

~~9.4.4 For pipe systems operating at cryogenic temperatures lower than minus 55°C, a LR materials certificate is required.~~

9.6 Valves for cryogenic temperature service

9.6.2 The tightness test required by ~~Ch 5, 3 Type tests on piping components~~ 5.13.1.1 of the Rules for Ships for Liquefied Gases is to be conducted in accordance with a recognised National or International Code or Standard.

9.8 Expansion bellows

(*Part only shown*)

9.8.1 The following plans and particulars are to be submitted:

(c) A proposed ~~proto~~type test program covering the tests detailed in ~~Ch 5, 3 Type tests on piping components~~ 5.13.1.2 of the Rules for Ships for Liquefied Gases.

9.8.3 For each type of expansion bellows, an element of the bellows, not pre-compressed, is to be pressure tested at not less than five times the design pressure without bursting. This test is to be conducted at room temperature on each 'type' of element and need not be the complete bellows unit. A test on one element can cover other sized bellows with the same cross-sectional bellows form. The design pressure is to be at least ~~10 bar~~ 1 MPa gauge; bellows fitted to safety valves and vent lines may have a minimum design pressure of ~~5 bar~~ not less than the lower of 0,5 MPa gauge or 10 times the relief valve set pressure in accordance with Ch 5, ~~2.3 Design pressure~~ 5.4.1 of the Rules for Ships for Liquefied Gases. The required test duration is not to be less than 5 minutes.

9.8.6 A cyclic fatigue test, representing ship deformation, is to be performed on a complete expansion joint, without internal pressure, by simulating the bellows movement corresponding to a compensated pipe length, for at least 2,000,000 cycles at a frequency not higher than 5 ~~cycles per second~~ Hz. ~~The test may be waived if the piping arrangement, experiences ship deformation loads.~~ NDE is required after cyclic testing. This test is only required when, due to the piping arrangement, ship deformation loads are actually experienced.

~~9.8.7 The cyclic thermal movement test and cyclic fatigue test may be waived by LR if satisfactory documentation is provided to establish the suitability of the expansion joints to withstand the expected working conditions. Where the maximum internal pressure exceeds 1,0 bar gauge, this documentation is to include sufficient test data to justify the design method used, with particular reference to correlation between calculation and test results.~~

Part 5, Chapter 15

Piping Systems for Oil Tankers

Effective date 1 January 2016

■ *Section 1*
General requirements

1.7 Arrangements for fixed hydrocarbon gas detection systems in double hull and double bottom spaces of oil tankers

1.7.1 In accordance with SOLAS 1974, as amended, Ch II-2/B, Reg. 4.5.7, double hull and double bottom spaces of oil tankers with a deadweight of 20 000 tonnes and above that are not provided with a constant operative inerting system (COIS) are to be provided with a fixed hydrocarbon gas detection system.

1.7.3 Where a constant operative inerting systems (COIS) is provided in lieu of fixed hydrocarbon detection the arrangements are to be submitted for consideration.

■ *Section 8*
Inert gas systems on Tankers of 8,000 tonnes DWT and above

8.1 General

~~8.1.1 The following requirements apply where an inert gas system, based on flue gas, is fitted on board ships intended for the carriage of oil in bulk having a flash point not exceeding 60°C (closed-cup test). For inert gas systems utilising nitrogen, additional requirements contained in Pt 5, Ch 15, 8.10 Nitrogen generator systems are to be applied.~~

~~8.1.4~~ 8.1.1 ~~The~~ An inert gas system ~~is to~~ complying with the applicable requirements of Chapter 15 of the FSS code as amended by MSC.367(93), is to be fitted on tankers of 8,000 tonnes DWT and above~~, insofar as they are applicable, to new ships only~~. For purposes of classification any use of the word "Administration" in the Regulation is to be taken as meaning LR. *See* 8.10 for additional requirements for inert gas systems utilising nitrogen.

Existing paragraphs 8.1.5 *to* 8.1.9 *have been deleted*.

8.2 Gas supply

Existing paragraphs 8.2.2 *to* 8.2.6 *have been deleted.*

Existing sub-Sections 8.3, 8.4 *and* 8.5 *have been deleted*.

~~8.6~~ 8.3 Venting arrangements

Existing paragraphs 8.6.1 *to* 8.6.4 *have been renumbered* 8.3.1 *to* 8.3.4.

(*Part only shown*)

~~8.6.2~~ 8.3.2 The arrangements for inerting, purging or gas freeing of empty tanks as required in ~~Pt 5, Ch 15, 8.2 Gas supply~~ by 2.2.1.2.1 to .3 of Ch 15 of the FSS Code, as amended by MSC.367(93) are to be such that the accumulation of hydrocarbon vapours in pockets formed by the internal structural members in a tank is minimised and that:

~~(d) if a connection is fitted between the inert gas supply mains and the cargo piping system, arrangements are to be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This is to consist of two shut-off valves with an arrangement to vent the space between the valves in a safe manner or an arrangement consisting of a spool-piece with associated blanks. The valve separating the inert gas supply main from the cargo main and which is on the cargo main side is to be a non-return valve with a positive means of closure.~~

Existing sub-Section 8.7 *has been renumbered sub-Section* 8.4*.*

~~8.8~~ 8.5 Instrumentation and alarms

~~8.8.1~~ 8.5.1 Alarms and safeguards are ~~indicated in Pt 5, Ch 15, 8.8 Instrumentation and alarms to Pt 5, Ch 15, 8.8 Instrumentation and alarms~~ to be provided in accordance with 2.2.4 and 2.3.2 of the FSS Code as amended by MSC.365(93) and Table 15.8.1 Inert gas systems – Alarms and safeguards.

Table 15.8.1: Inert gas systems – Alarms and safeguards

Item	Alarm	Note
~~Water pressure or water flow to flue gas scrubber~~	~~Low~~	~~1, 2, 3~~
~~Water level in flue gas scrubber~~	~~High~~	~~1, 2, 3~~
~~Inert gas temperature from inert gas blowers~~	~~High~~	~~1, 2, 3~~
~~Inert gas blower operation~~	~~Failure~~	~~4~~
~~Oxygen content of gas in excess of 5%~~	~~High~~	~~5,6~~
~~Power supply to automatic control system for inert gas regulating valve and indicating devices~~	~~Failure~~	~~5~~
~~Water level in inert gas system water seal~~	~~Low~~	~~7~~
~~Inert gas pressure discharge from inert gas blowers less than 100 mm water gauge~~	~~Low~~	~~5, 8~~
~~Inert gas pressure~~	~~High~~	~~8~~
Combustion air pressure to oil burner	Low	~~3~~1
Fuel oil pressure	Low	-
Fuel oil temperature or viscosity	High and Low	~~9~~3
Burner flame and ignition	Failure	~~3~~1, 2
Cooling water temperature	High	-
~~Fuel oil supply~~	~~Insufficient~~	~~-~~
~~Power supply to inert gas generator~~	~~Failure~~	4
Automatic control system power supply	Failure	-

Note 1. Combustion spaces are to be purged automatically before re-ignition takes place in the event of a flame out on all burners.

~~Note 2. Inert gas blowers to be shut down automatically and inert gas regulating valve is to be closed automatically.~~

Note ~~3~~ 2. Fuel oil to burner to be shut off automatically.

~~Note 4. Inert gas regulating valve to be closed automatically.~~

~~Note 5 To be fitted in the machinery space and cargo control room, where provided, *see* Pt 5, Ch 15, 8.8 Instrumentation and alarms.~~

~~Note 6 Operator is required to submit operational procedures for the suspension of cargo operations until inert gas quality is improved for review, *see* 7.8.17.~~

~~Note 7 For dry and semi-dry water seals, *see* Pt 5, Ch 15, 8.8 Instrumentation and alarms.~~

~~Note 8 *see* Pt 5, Ch 15, 8.8 Instrumentation and alarms.~~

Note ~~9~~ 3. Heavy oil only.

Note ~~10~~ 4. ~~The Table contains the minimum list of alerts and shutdowns for an inert gas generator; a~~Additional alerts and shutdowns may be necessary as determined through risk-mitigating activities in response to the completed Risk-Based Analysis (e.g.~~,~~ FMECA) for the inert gas generator.

Existing paragraph 8.8.2 *has been renumbered* 8.5.2*.*

8.5.3 *See also* Pt 6, Ch 1 Control Engineering Systems for requirements for control, alarm and safety systems.

Existing paragraphs 8.8.3 *to* 8.8.17 *have been deleted*.

Existing sub-Section 8.9 *has been renumbered* 8.6.

~~8.10~~ 8.7 Nitrogen generator systems

~~8.10.1~~ 8.7.1 The following requirements ~~are specific only to the gas~~ apply where a nitrogen generator system is fitted on board Tankers of 8,000 tonnes DWT and above. ~~and apply where~~ For the purpose, the inert gas is to be produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.

~~8.10.2~~ 8.7.2 Alarms and safeguards are ~~indicated in Pt 5, Ch 15, 8.10 Nitrogen generator systems to Pt 5, Ch 15, 8.10 Nitrogen generator systems~~ to be provided in accordance with 2.2.4 and 2.3.2 of the FSS Code as amended by MSC.365(93) and Table 15.8.2 Nitrogen generator systems – Alarms and safeguards.

Table 15.7.2: Nitrogen generator systems; Alarms and safeguards

Item	Alarm	Note
~~Feed air pressure from air compressor~~	~~Low~~	~~1, 4~~
~~Air compressor discharge temperature~~	~~High~~	~~1, 4~~
~~Water level in condensate drain separator~~	~~High~~	~~1, 4~~
~~Electric heater (where fitted)~~	~~Failure~~	~~1, 4~~
Oxygen content	High	1, 2, ~~4~~3
Power supply to oxygen content monitoring instrumentation downstream of Nitrogen generator	Failure	~~1,~~ 3

Note 1 To be fitted in the machinery space and cargo control room, where provided~~, *see* Pt 5, Ch 15, 8.8 Instrumentation and alarms~~.

Note 2 Oxygen content not to exceed 5% with automatic discharge to atmosphere where this is exceeded, *see* Pt 5, Ch 15, ~~8.10 Nitrogen generator systems~~ 8.7.5.

~~Note 3 *See* Pt 5, Ch 15, 8.10 Nitrogen generator systems.~~

Note ~~4~~ 3 Automatic shutdown of inert gas generating system.

Note ~~5~~ 4 The Table contains the minimum list of alerts and shutdowns for an inert gas generator and is in addition to 2.2.4 and 2.4.2 of the FSS Code as amended by MSC.365(93); additional alerts and shutdowns may be necessary as determined through risk-mitigating activities in response to the completed Risk-Based Analysis (e.g. FMECA) for the inert gas generator.

~~8.10.3~~ 8.7.3 ~~Where nitrogen generator systems are provided in place of boiler flue gas or oil fired inert gas generators referred to in Pt 5, Ch 15, 8.1 General, the following requirements of Chapter 15 of the FSS Code remain applicable for the piping arrangements, alarms and instrumentation downstream of the gas generator: 2.3.1.3.1, 2.3.1.3.2, 2.3.1.5, 2.3.2, 2.4.2, 2.4.3.1.6, 2.4.3.1.8, 2.4.3.1.9, 2.4.3.3, 2.4.3.4, 2.4.4, as well as~~ In addition to the applicable requirements of Ch 15 of the FSS Code, as amended by MSC.367(93), the nitrogen generator system is to comply with SOLAS ~~Reg.~~ regulations II-2/4.5.3.4.2, 4.5.6.3 and 11.6.3.4.

~~8.10.4~~ 8.7.4 A nitrogen generator consisting of a feed air treatment system and any number of membrane or adsorber modules in parallel is to be capable of delivering nitrogen to the cargo tanks at ~~a rate of at least 125 per cent of the maximum discharge capacity of the ship expressed as a volume to time rate~~ the rate required by paragraph 2.2.1.2.4 of Ch 15 of the FSS Code, as amended by MSC.367(93).

~~8.10.5 The air compressor and the nitrogen generator may be installed in the engine-room or in a separate compartment, which may be treated as an "other machinery space" with respect to fire protection.~~

~~8.10.6 Where a separate compartment is provided, it is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing at least 6 air changes per hour. The compartment is to have no direct access to accommodation spaces, service spaces and control stations, and is to be provided with oxygen level detection equipment with a low oxygen level alarm.~~

~~8.10.7~~ 8.7.5 The nitrogen generator is to be capable of delivering high purity nitrogen with ~~oxygen content not exceeding 5 per cent by volume~~ an oxygen content in accordance with paragraph 2.2.1.2.5 of Ch 15 of the FSS Code, as amended by MSC.367(93). In addition to meeting the venting requirements of paragraph 2.2.2.4 of Ch 15 of the FSS Code, as amended by MSC.367(93), ~~T~~the system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation~~ when predetermined limits are reached, *see* Pt 5, Ch 15, 8.10 Nitrogen generator systems to Pt 5, Ch 15, 8.10 Nitrogen generator systems~~.

~~8.10.8~~ 8.7.6 ~~The system is to be provided with two air compressors.~~ The system is to be provided with one or more compressors to generate enough positive pressure to be capable of delivering the total volume of gas required by 2.2.1.2 of the FSS Code, as amended by MSC.367(93). Where two compressors are provided, ~~T~~the total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required. ~~A system with one air compressor only may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.~~

8.7.7 Where the nitrogen system includes a nitrogen storage tank which has sufficient capacity to deliver the total volume of gas required by 2.2.1.2 of the FSS Code, as amended by MSC.367(93), in the event of failure of a compressor a single compressor may be accepted provided that sufficient spares are carried on board to enable the failure to be rectified by the ship's crew. The list of spare parts required is to be supplied by the manufacturer and supported by a reliability analysis of the specific system submitted to and verified by LR. The size of the nitrogen storage tank is to be specified.

~~8.10.9~~ 8.7.8 ~~A~~ The feed air treatment system ~~is to be~~ fitted to remove free water, particles and traces of oil from the compressed air as required by 2.4.1.2 of Ch 15 of the FSS Code, as amended by MSC.367(93), is also~~, and~~ to maintain the specification temperature.

~~8.10.10 Where a nitrogen receiver/buffer tank is required to be fitted it may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the access is to be arranged from the open deck only and the access door is~~

~~to open outwards. Permanent ventilation and alarm arrangements are to be fitted as required by Pt 5, Ch 15, 8.10 Nitrogen generator systems.~~

Existing paragraphs 8.10.11 *and* 8.10.12 *have been renumbered* 8.7.9 *and* 8.7.10*.*

Existing paragraphs 8.10.13 *to* 8.10.19 *have been deleted*.

~~8.11~~ 8.8 Nitrogen/inert gas systems fitted for purposes other than inerting required by SOLAS Reg. II-2/4.5.5.1~~.1~~

~~8.11.1~~ 8.8.1 This section applies to systems fitted on oil tankers ~~of less than 20000 DWT~~ to which SOLAS regulation II-2/4.5.5.1 does not apply.

8.8.2 The requirements given in Ch 15, 2.2.2, 2.2.4, 2.4.1 and 2.4.2 of the FSS Code, as amended by MSC.367(93), apply to the systems as applicable.

~~8.11.2~~ 8.8.3 The requirements of Pt 5, Ch 15, ~~8.10~~ 8.7 Nitrogen generator systems apply except paragraphs Pt 5, Ch 15, ~~8.10 Nitrogen generator systems, Pt 5, Ch 15, 8.10 Nitrogen generator systems, Pt 5, Ch 15, 8.10 Nitrogen generator systems and Pt 5, Ch 15, 8.10 Nitrogen generator systems~~ 8.7.1, 8.7.3, 8.7.4, 8.7.6 and 8.7.7.

8.8.4 Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the LR Rules for Materials.

8.8.5 All the equipment is to be installed on board and tested under working conditions to the satisfaction of the Surveyor.

~~8.11.3~~ 8.8.6 The two non-return devices as required by paragraph 2.2.3.1.1 of Ch 15 of the FSS Code, as amended by MSC.367(93) are to be fitted in the inert gas main. The non-return devices are to comply with 2.2.3.1.2 and 2.2.3.1.3 of Ch 15 of the FSS Code, as amended by MSC.367(93); however, ~~W~~where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required by ~~Pt 5, Ch 15, 8.10 Nitrogen generator systems~~ paragraph 2.2.3.1.1 of Ch 15 of the FSS Code, as amended by MSC.367(93), may be substituted by two non-return valves.

Part 6, Chapter 2

Electrical Engineering

Effective date 1 January 2016

■ *Section 1*
General requirements

1.10 Inclination of ship

1.10.2 In ships for the carriage of liquefied gas the emergency source of electrical power is also to remain operable under the conditions described in the *Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk* (hereinafter referred to as the Rules for Ships for Liquefied Gases), Chapter 10,~~Ch 10, 1 General~~ LR 10.1-08 General. In ships for the carriage of liquid chemicals the emergency source of electrical power is also to remain operable under the conditions described in the *Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquid Chemicals in Bulk* (hereinafter referred to as the Rules for Ships for Liquid Chemicals), Chapter 10, Ch 10, 1 General General.

■ *Section 11*
Electric cables, optical fibre cables and busbar trunking systems (busways)

11.4 Operating temperature

Table 2.11.2: Maximum rated conductor temperature

Type of insulating compound	Maximum rated conductor temperature, °C		
	Abbreviated designation	Normal operation	Short-circuit
~~**Thermoplastic, based upon:**~~ ~~Polyvinyl chloride or co-polymer of vinyl chloride and vinyl acetate~~		~~70~~	~~150~~
Elastomeric or thermosetting, based upon:			
Ethylene-propylene rubber or similar (EPM or EPDM)	EPR	90	250
High modulus or hard grade ethylene propylene rubber	HEPR	90	250
Cross-linked polyethylene	XLPE	90	250
~~Ethylene-propylene rubber or similar (EPM or EPDM) halogen free~~		~~90~~	~~250~~
~~High modulus or hard grade halogen-free ethylene propylene rubber~~		~~90~~	~~250~~
~~Halogen-free cross-linked polyethylene~~		~~90~~	~~250~~
Cross-linked polyolefin material for halogen-free cables	HF90	90	250
Silicone rubber	S95	95	350
~~Halogen-free silicone rubber~~		~~95~~	~~350~~

11.5 Construction

11.5.3 Where electric and optical fibre cables are required to be of a `fire resistant type', they are in addition to be easily distinguishable and comply with the performance requirements of the appropriate part of IEC 60331: *Tests for electric cables under fire conditions – Circuit integrity*,when tested with a minimum flame application time of 90 minutes, as follows:

- IEC 60331-1:*Tests for electric cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least ~~830°C~~ 830 degrees C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm*.
- IEC 60331-2: *Tests for electric cables under fire conditions – Circuit integrity – Part 2: Test method for fire with shock at a temperature of at least 830 Degrees C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter not exceeding 20 mm;*
- IEC 60331-21: *Tests for electric cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV*;
- IEC 60331-23: *Tests for electric cables under fire conditions – Circuit integrity – Part 23: Procedures and requirements – Electric data cables*; or
- IEC 60331-25: *Tests for electric cables under fire conditions – Circuit integrity – Part 25: Procedures and requirements – Optical fibre cables.*

11.6 Conductor size

Table 2.11.3: Electric cable current ratings, normal operation, based on ambient 45°C

Nominal cross-section (mm^2)	Continuous r.m.s. current rating, in amperes								
	~~Thermoplastic, (70°C)~~			Elastomeric (90°C)			Elastomeric or thermosetting, based on silicon rubber (95°C)		
	~~Single Core~~	~~2 core~~	~~3 or 4 core~~	Single Core	2 core	3 or 4 core	Single Core	2 core	3 or 4 core
0,75	~~10~~	~~8~~	~~7~~	15	13	11	17	14	12
1	~~12~~	~~10~~	~~8~~	18	15	13	20	17	14
1,25	~~13~~	~~11~~	~~9~~	21	18	14	23	20	16
1,5	~~15~~	~~13~~	~~11~~	23	20	16	26	22	18
2	~~18~~	~~15~~	~~12~~	28	24	19	31	26	22
2,5	~~21~~	~~18~~	~~15~~	30	26	21	32	27	22
3,5	~~26~~	~~22~~	~~18~~	37	32	26	39	33	28
4	~~29~~	~~25~~	~~20~~	40	34	28	43	37	30
5,5	~~35~~	~~30~~	~~24~~	49	42	35	52	44	37
6	~~37~~	~~31~~	~~26~~	52	44	36	55	47	39
8	~~44~~	~~37~~	~~31~~	62	53	44	66	56	46
10	~~51~~	~~43~~	~~36~~	72	61	50	76	65	53
14	~~62~~	~~53~~	~~44~~	88	75	62	94	80	66
16	~~68~~	~~58~~	~~48~~	96	82	67	102	87	71
22	~~83~~	~~70~~	~~58~~	117	100	82	124	106	87
25	~~90~~	~~77~~	~~63~~	127	108	89	135	115	95
30	~~101~~	~~85~~	~~70~~	142	121	100	151	128	106
35	~~111~~	~~94~~	~~78~~	157	133	110	166	141	116
38	~~117~~	~~99~~	~~82~~	165	140	116	175	149	122
50	~~138~~	~~117~~	~~97~~	196	167	137	208	177	146
60	~~155~~	~~132~~	~~109~~	220	187	154	233	198	163
70	~~171~~	~~145~~	~~120~~	242	206	169	256	218	179
80	~~186~~	~~158~~	~~130~~	263	224	184	278	237	195
95	~~207~~	~~176~~	~~145~~	293	249	205	310	264	217
100	~~213~~	~~181~~	~~149~~	302	257	212	320	272	224
120	~~239~~	~~203~~	~~167~~	339	288	237	359	305	251
125	~~245~~	~~209~~	~~172~~	348	295	243	368	313	258
150	~~275~~	~~234~~	~~193~~	389	331	272	412	350	288
185	~~313~~	~~266~~	~~219~~	444	377	311	470	400	329
200	~~329~~	~~280~~	~~230~~	466	396	326	494	420	346
240	~~369~~	~~314~~	~~258~~	522	444	365	553	470	387
300	~~424~~	~~360~~	~~297~~	601	511	421	636	541	445

Table 2.11.4: Electric cable current ratings, r.m.s. short-circuit current

Nominal cross-section (mm^2)	~~Fault current (kA) at 150°C~~			Fault current (kA) at 250°C			Fault current (kA) at 350°C		
	~~1 s duration~~	~~0,5 s duration~~	~~0,1 s duration~~	1 s duration	0,5 s duration	0,1 s duration	1 s duration	0,5 s duration	0,1 s duration
0,75	~~0,1~~	~~0,1~~	~~0,3~~	0,1	0,2	0,3	0,1	0,2	0,4
1	~~0,1~~	~~0,2~~	~~0,3~~	0,1	0,2	0,5	0,2	0,2	0,5
1,25	~~0,1~~	~~0,2~~	~~0,4~~	0,2	0,3	0,6	0,2	0,3	0,7
1,5	~~0,2~~	~~0,2~~	~~0,5~~	0,2	0,3	0,7	0,3	0,4	0,8
2	~~0,2~~	~~0,3~~	~~0,7~~	0,3	0,4	0,9	0,3	0,5	1,1
2,5	~~0,3~~	~~0,4~~	~~0,9~~	0,4	0,5	1,1	0,4	0,6	1,4
3,5	~~0,4~~	~~0,5~~	~~1,2~~	0,5	0,7	1,6	0,6	0,8	1,9
4	~~0,4~~	~~0,6~~	~~1,4~~	0,6	0,8	1,8	0,7	1,0	2,2
5,5	~~0,6~~	~~0,8~~	~~1,9~~	0,8	1,1	2,5	0,9	1,3	3,0
6	~~0,7~~	~~0,9~~	~~2,1~~	0,9	1,2	2,7	1,0	1,5	3,2
8	~~0,9~~	~~1,2~~	~~2,8~~	1,1	1,6	3,6	1,4	1,9	4,3
10	~~1,1~~	~~1,5~~	~~3,5~~	1,4	2,0	4,5	1,7	2,4	5,4
14	~~1,5~~	~~2,2~~	~~4,8~~	2,0	2,8	6,3	2,4	3,4	7,6
16	~~1,7~~	~~2,5~~	~~5,5~~	2,3	3,2	7,2	2,7	3,9	8,7
22	~~2,4~~	~~3,4~~	~~7,6~~	3,1	4,5	10,0	3,8	5,3	11,9
25	~~2,7~~	~~3,9~~	~~8,6~~	3,6	5,1	11,3	4,3	6,0	13,5
30	~~3,3~~	~~4,6~~	~~10,4~~	4,3	6,1	13,6	5,1	7,3	16,2
35	~~3,8~~	~~5,4~~	~~12,1~~	5,0	7,1	15,8	6,0	8,5	18,9
38	~~4,1~~	~~5,9~~	~~13,1~~	5,4	7,7	17,2	6,5	9,2	20,6
50	~~5,5~~	~~7,7~~	~~17,3~~	7,2	10,1	22,6	8,6	12,1	27,1
60	~~6,5~~	~~9,3~~	~~20,7~~	8,6	12,1	27,1	10,3	14,5	32,5
70	~~7,6~~	~~10,8~~	~~24,2~~	10,0	14,2	31,7	12,0	16,9	37,9
80	~~8,7~~	~~12,3~~	~~37,6~~	11,4	16,2	36,2	13,7	19,4	43,3
95	~~10,4~~	~~14,7~~	~~32,8~~	13,6	19,2	43,0	16,3	23,0	51,4
100	~~10,9~~	~~15,4~~	~~34,5~~	14,3	20,2	45,2	17,1	24,2	54,1
120	~~13,1~~	~~18,5~~	~~41,4~~	17,2	24,3	54,3	20,5	29,0	64,9
125	~~13,6~~	~~19,3~~	~~43,1~~	17,9	25,3	56,6	21,4	30,2	67,6
150	~~16,4~~	~~23,2~~	~~51,8~~	21,5	30,4	67,9	25,7	36,3	81,2
185	~~20,2~~	~~28,6~~	~~63,9~~	26,5	37,4	83,7	31,7	44,8	100,1
200	~~21,8~~	~~30,9~~	~~69,0~~	28,6	40,5	90,5	34,2	48,4	108,2
240	~~26,2~~	~~37,0~~	~~82,8~~	34,3	48,6	108,6	41,1	58,1	129,9
300	~~32,7~~	~~46,3~~	~~103,6~~	42,9	60,7	135,7	51,3	72,6	162,3

11.7 Correction factors for cable current rating

Table 2.11.5: Correction factors

Insulation material	Correction factor for ambient air temperature of °C										
	35	40	45	50	55	60	65	70	75	80	85
~~Thermoplastic (70°C)~~	~~1,18~~	~~1,10~~	~~1,00~~	~~0,89~~	~~0,77~~	~~0,63~~	—	—	—	—	—
Elastomeric or thermosetting (90°C)	1,10	1,05	1,00	0,94	0,88	0,82	0,74	0,67	0,58	0,47	—
Elastomeric or thermosetting, based on silicone rubber (95°C)	1,10	1,05	1,00	0,95	0,89	0,84	0,77	0,71	0,63	0,55	0,45

11.8 Installation of electric cables

Table 2.11.6: Minimum internal radii of bends in cables for fixed wiring

Cable construction		Overall diameter of cable	Minimum internal radius of bend (times overall diameter of cable)
Insulation	Outer covering		
~~Thermoplastic and e~~Elastomeric 600/1000 V and below	Metal sheathed Armoured and braided	Any	6*D*
	Other finishes	≤ 25 mm > 25 mm	4*D* 6*D*
Mineral	Hard metal sheathed	Any	6*D*
~~Thermoplastic and e~~Elastomeric above 600/1000 V			
– single core	Any	Any	12*D*
– multicore	Any	Any	9*D*

■ *Section 14*
Electrical equipment for use in explosive gas atmospheres or in the presence of combustible dusts

14.13 Special requirements for ships with spaces for carrying vehicles with fuel in their tanks, for their own propulsion

(*Part only shown*)

14.13.4 **Cargo ships with closed ro-ro cargo spaces for carrying vehicles:**

(b) where the ventilation system required by SOLAS 1974 as amended, Chapter II-2, Regulation ~~20.3.1.1.1~~ 20.3.1.1 is arranged to operate continuously and is sufficient to provide at least ten air changes per hour, whenever vehicles are on board, above a height of 45 cm from the vehicle deck, or any platform on which vehicles are carried, electrical equipment is to be of a type acceptable for **zone 2**, or is to have an enclosure of ingress protection rating of at least IP 55;

14.13.5 **Vehicle carriers with spaces for carrying vehicles with compressed natural gas in their tanks, for their own propulsion:**
- electrical equipment fitted within the space and within any ventilation trunking for the space, is to be of a type acceptable for **zone 1**. *See also* Pt 6, Ch 2, 14.2.7.

14.13.6 **Vehicle carriers with spaces for carrying vehicles with compressed hydrogen in their tanks for their own propulsion:**
- electrical equipment fitted within the space and within any ventilation trunking for the space, is to be of a type acceptable for **zone 1**. *See also* Pt 6, Ch 2, 14.2.7.

■ *Section 17*
Fire safety systems

17.6 Fire safety stops

17.6.6 ~~In passenger ships carrying 36 passengers or more, exhaust ducts from main laundries are to be fitted with additional remote-control arrangements for shutting off the exhaust fans and supply fans from within the space and for operating electrically operated fire dampers fitted at the lower end of the duct.~~ In passenger ships and cargo ships, to which SOLAS 1974 as amended applies, exhaust ducts from main laundries, drying rooms and galley ranges are to be fitted with additional remote-control arrangements as required by SOLAS, Chapter II-2, Part C, Regulation 9, Section 7.

17.8 Fire dampers

17.8.3 ~~In passenger ships carrying 36 passengers or more, where electrically operated fire dampers are fitted at the lower end of exhaust ducts from main laundries, they are to be capable of automatic and remote operation.~~ In passenger ships and cargo ships, to which SOLAS 1974 as amended applies, where electrically operated fire dampers are fitted in main laundries, drying rooms and galley ranges, they are to be as required by SOLAS, Ch II-2, Part C, Regulation 9, Section 7.

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